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VIDEO PROBE INSPECTION OF ROOFBOLT HOLES AT H-W MINE, WESTMIN RESOURCES

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ABSTRACT

Thirty roofbolt holes at the H-W Mine of Westmin Resources Ltd., Campbell River, B.C. have been inspected with a colour videoprobe and recorded on videotape. The records are needed as background documentation for an in situ trial of prototype stainless steel Swellex bolts. The test site is located on 2300 level at 23-354 drift west. The rock mass which consists of massive pyrite with some mafic dykes can be classifed as good. The video survey showed that near vertical discontinuities occur in nearly all roofbolt holes. Horizontal and sub-horizontal fractures are not distinct or clearly visible in the inspected boreholes. However, visual observation of the test site indicated that these features exist. No borehole breakouts were observed.

Key words: Video probe unit; Video borehole survey; Swellex roofbolts.

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INSPECTION PAR SONDE VIDÉO DE TROUS DE BOULONS D'ANCRAGE À LA MINE H-W DE LA WESTMIN RESOURCES

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RÉSUMÉ

Trente trous de boulons d'ancrage à la mine H-W de la Westmin Resources Ltd. à Campbell River (C.-B.) ont été inspectés avec une sonde vidéo couleur et les données ont été enregistrées sur bande vidéo. Ces enregistrements serviront de documentation de base pour un essai sur le terrain de boulons Swellex prototypes en acier inoxydable. Le site choisi est situé au niveau 2300, à la galerie ouest 23-354. Le massif rocheux composé de pyrite massive recoupée de dykes mafiques est jugé de bonne qualité. Le sondage vidéo a indiqué des discontinuités quasi verticales dans presque tous les trous d'ancrage dans le toit. Les fractures horizontales and sub-horizontales ne ressortent pas distinctement ou ne sont pas nettement visibles dans les trous inspectés. Toutefois, une inspection visuelle du site d'essai a révélé l'existence de ces fractures. Aucune rupture de trou n'a été observé

Termes-clés: sonde vidéo; levé de trous de sondage par vidéo; boulons d'ancrage Swellex.
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INTRODUCTION

Two prototypes of stainless steel Swellex bolts developed by Atlas Copco have been produced with the support of Atlas Stainless, Associated Tube Industries and the Nickel Development Institute (1). The Nickel Development Institute is in charge of the field project to test the prototype bolts.

MRL at the request of the Nickel Development Institute, and in cooperation with INCO Ltd. and Falconbridge Ltd. undertook to carry out a video survey of a set of sixty boreholes at each mine site prior to installation of test bolts. This and a subsequent phase of the project has been carried out at the Kidd Creek Mine, Timmins, and the Stobie Mine, Sudbury (2,3).

In an agreement with Westmin Resources Ltd., a third test site was selected at H-W Mine, Campbell River, B.C. At H-W Mine, the drilling of boreholes for bolt installation was completed on August 8, 1989, and video inspection of the holes August 16, 1989.

The Video inspection provides a permanent photographic record of structural features of the test boreholes. Following the overcoring of representative samples of the three types of bolts used at the end of 6 months installation, stainless steel swellex, standard swellex and carbon steel bolt, subsequent coring will be carried out at 12 month intervals.

Structural data recorded by the video surveys and observations resulting from overcoring will be used in studies of corrosion mechanisms and rockbolt behaviour.

MINING BACKGROUND

Westmin Resources Ltd. operates a 4000 mtpd base metal mine/mill complex at the south end of Buttle Lake on Vancouver Island. The mine site, located in Strathcona Provincial Park, is accessed by a 90 km highway from Campbell river. Figure 1, shows the location of H-W Mine, Westmin Resources Ltd.

The polymetallic massive sulphide deposits occur as several ore zones which have been mined by various mining operations. Currently, mining is concentrated on H-W deposit at an average depth of 650 m below surface. The tabular shaped orebody with dimensions of 850 m by 220 m has a mineable thickness up to 35 m. The orebody is characterized by a high sulphur content with an average of over 50% pyrite.

Because of variability in geometry of the orebody, grade distribution, and ground conditions, several mining methods (room and pillar, cut-and-fill and blast hole) are utilized to maintain production requirements. Ground conditions vary significantly throughout the mine. In addition to the use of hydraulic and waste fill, different types of conventional ground support systems are used to improve and maintain the stability of mine openings.

Detailed information on studies of geological setting, mining practices and geomechanical carried out by the geotechnical division of the mine are given in References 4, 5 and 6.

VIDEO EQUIPMENT

The Video Probe 2000 equipment consists of a video probe, a video processor, a colour monitor, a character generator keyboard, and a standard video cassette recorder (VCR), as illustrated in Figure 2. The Video Probe 2000 system is manufactured by Welch Allyn Inc., Video Division (7).

The operation of the system requires an AC power supply of 110 volts, 15A/60 Hz. The video probe has a length of 15.2 m and the camera head and cable are 10.2 mm O.D. The probe provides an axial view, but can be equipped with a side viewing attachment (a reflection mirror). On viewing the video display the observer needs to consider that the linear magnification is about 5 times and the areal magnification is 28 times.

The video record can be complemented by written comments through keyboard entries or by spoken comments with the aid of a microphone. The

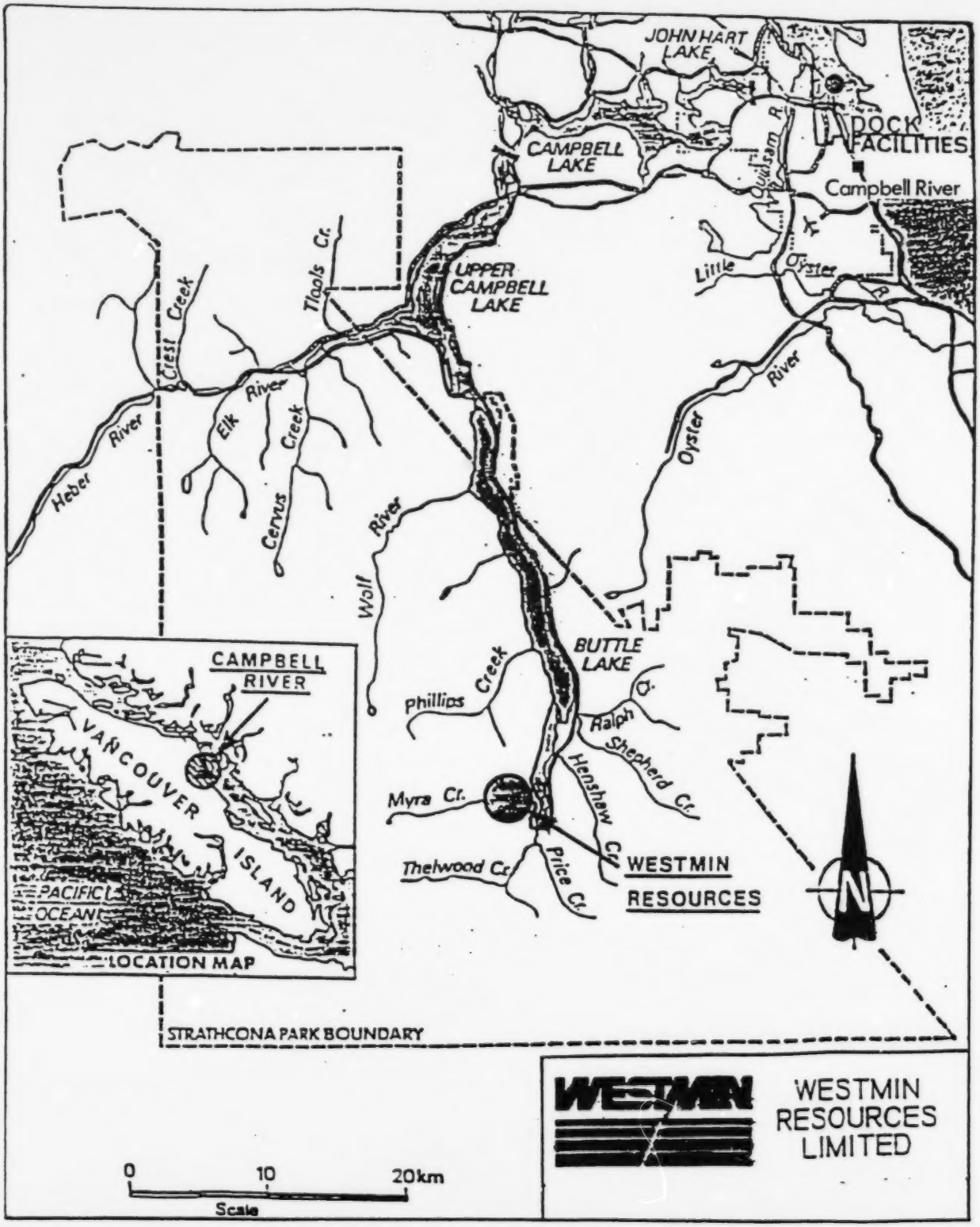

Fig. 1 - Location of H-W Mine, Westmin Resources Ltd.

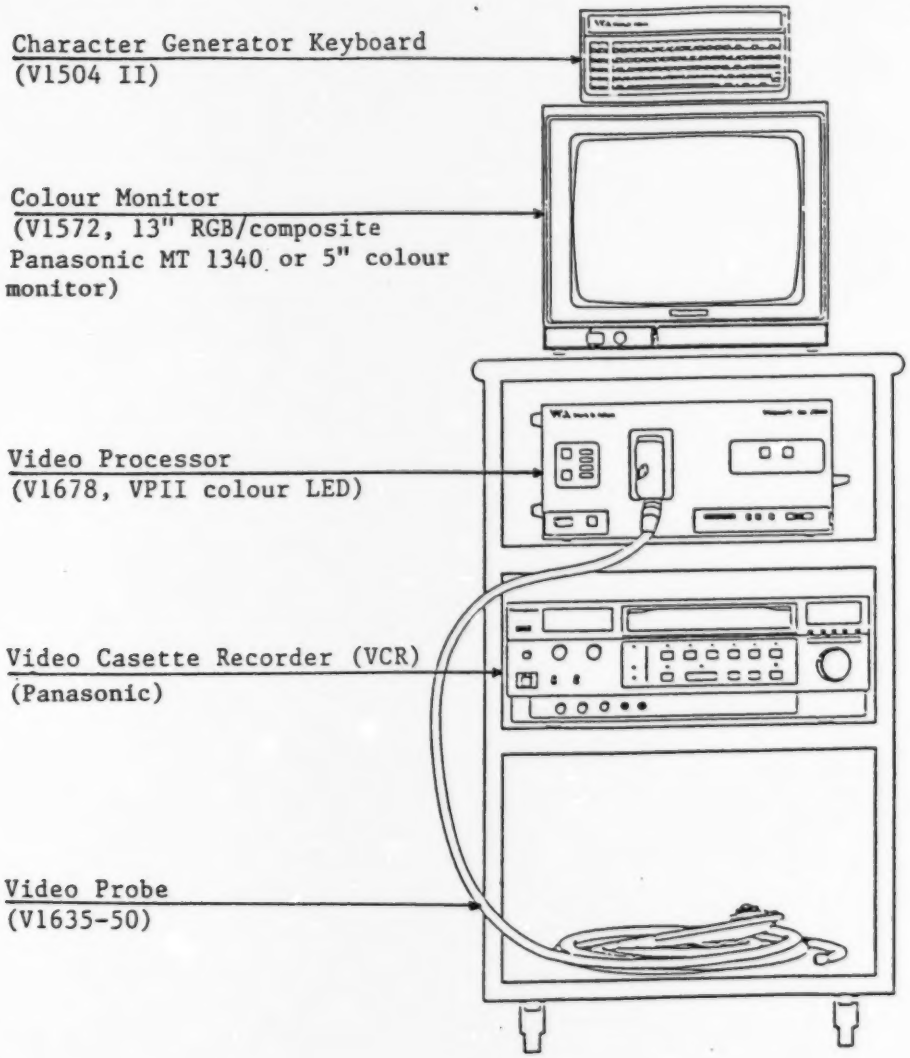

Fig. 2 - Video Probe 2000 - system components (7).

illumination on the video processor is controlled by an automatic level controller which makes the operation effective. Manual control of illumination is also provided.

For borehole inspection the video probe cable and camera head were fed through aluminum rods (O.D. - 21 mm, I.D. - 15 mm) and the camera head connected to the leading end of the top rods. The camera head positioned closely to the hole centre permitted rotation of the probe in the hole, and provided optimum illumination of the borehole wall. The first rod section (1.8 m) was marked at 5 and 10 cm intervals so that the position (distance) of fractures relative to the borehole collar could be recorded during the survey.

Electrical power for the instruments was supplied by a portable generator.

BOREHOLE INSPECTION

The selected H-W Swellex test site was located on 2300 level at 23-354 drift west as shown in the mine plan, Figure 3. The rock mass at the test site can be classified as good. The rock type is locally defined as massive pyrite with some mafic dykes. The roof in the test area is dry. Conventional mechanical bolts are used for roof support.

Ten sets of three boreholes (holes and sections approximately 1.20 m apart) had been drilled 1.8 m deep into the roof. The holes were drilled with 1.5 inch tungsten carbide bits. Location of boreholes and details of layout are shown in Figure 4. The test boreholes start with section (row) number 1 at the east, and progressed west to section number 10. Video recording of the holes followed the same sequence, i.e., beginning at the east and progressing west to section number 10. At the individual section video recordings started with the north hole followed by the vertical and south holes in that order. A seven position alpha-numeric code is used for hole identification: the first

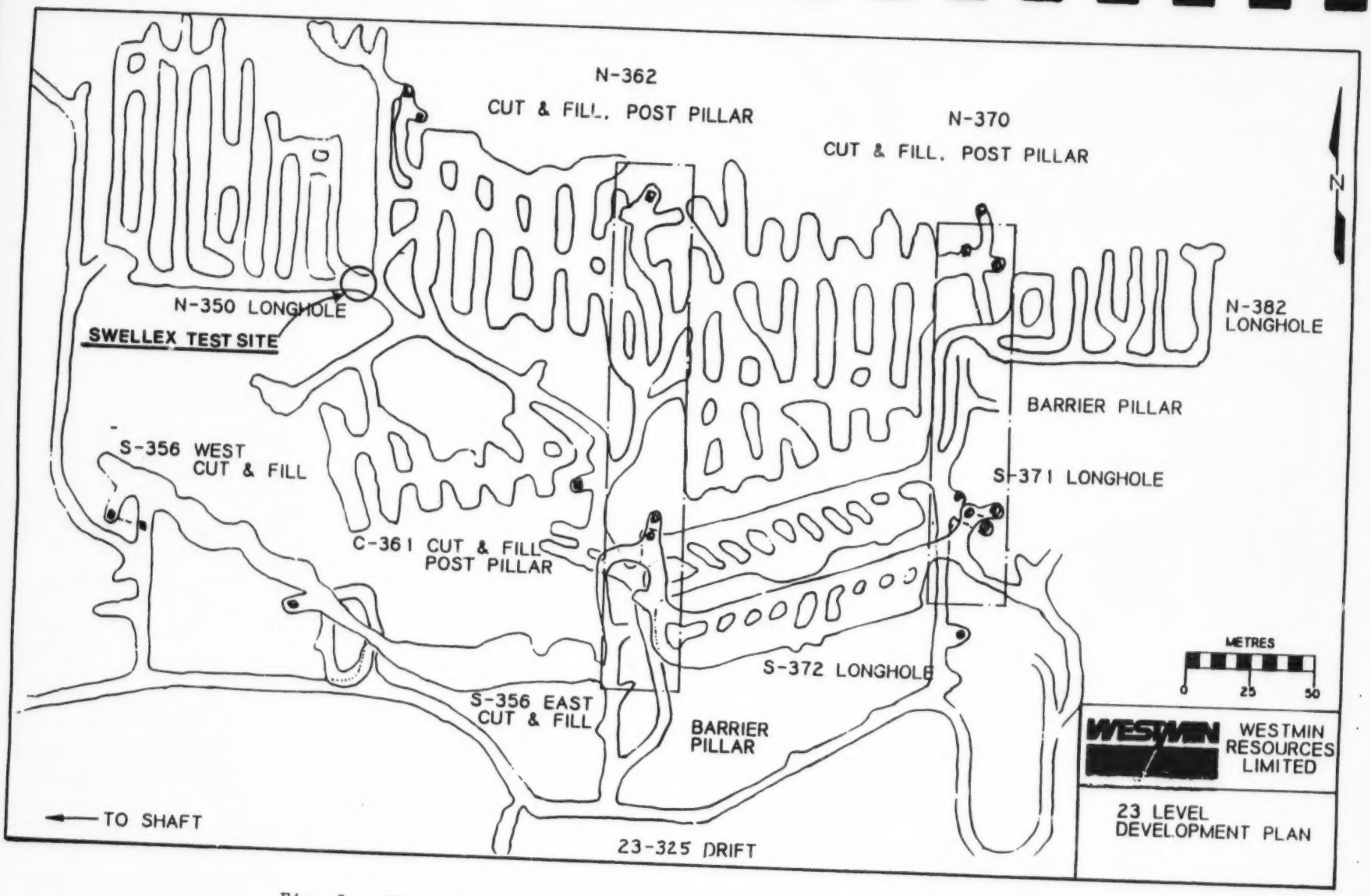

Fig. 3 - 2300 level mine openings and the location of Swellex test site.

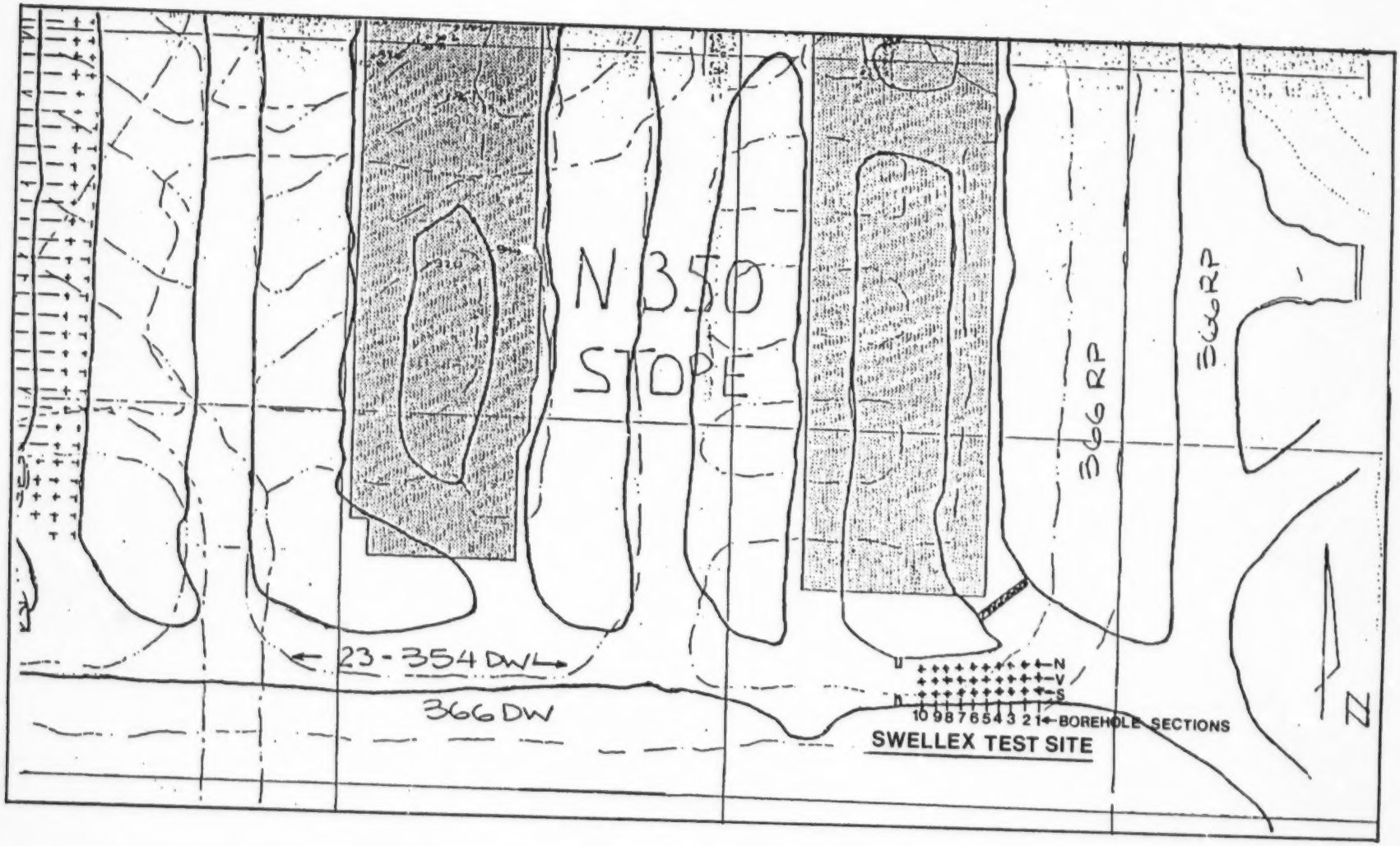

Fig. 4 - Layout of Swellex boreholes on the 23-354 drift west.

two identify the mine (HW - H-W Mine), the next two the level (23 - 2300 level), the next one the location (N - North, V - Vertical, S - South), and the last two the section number (02 - section number 2). All thirty boreholes were inspected and recorded on colour video tape. The video recording for most holes started at the borehole collar. After reaching the bottom of the borehole the video probe is slowly retracted to provide an axial view of the borehole wall. The video probe was stopped occasionally to record the position of fractures (cracks), and also to provide, where needed, a more detailed view of the borehole wall. The shaky video image at the midway point of individual hole surveys results from disconnecting rods to allow clearance for retraction.

The video inspection of the boreholes showed that nearly all holes are fractured at the collar. Axial viewing of the hole walls indicated predominantly near vertical fractures and planar joints oriented along the axis of the holes. Horizontal and sub-horizontal fractures intersecting the holes are not clearly identified by the video survey. The side viewing attachment was used only once (Hole No. HW23N06), but it did not provide improved viewing or additional details with respect to structural features. Visual observations of drift walls and roof observations at the test site indicate, however, the existence of horizontal and sub-horizontal fractures. The video survey showed that nearly all fractures are tight with no distinct aperture. No borehole breakouts were observed.

A summary of borehole inspections is provided in Table 1. To locate the individual holes using Table 1, the videotape counter should be set to zero at the start of displaying the tape. Changes of the counter positions are expected using different VCR units. An optimum picture quality is achieved with a high resolution monitor, such as the one provided with the Video Probe system. When displaying the videotape some adjustments may be required on the VCR ('Tracking') and Monitor (brightness, colour, contrast and

tint) units. Total viewing time of the videotape is 90 minutes.

ACKNOWLEDGEMENT

The cooperation of R. Goodwin, Geotechnical Engineer at H-W Mine, Westmin Resources Ltd. for effective scheduling and the assistance provided is greatly appreciated.

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Table 1 - Summary of Swellex borehole inspection, H-W Mine 23-354 drift west (video tape No. 1).

Section	Hole ID No.	Tape Counter Position	Location of Fractures (0 25 50 75 100 125 150 175 200 cm)
-	---	0000-0015	Title and borehole identification
01	HW23N01	0018-0170	1) 2)
	HW23V01	0175-0350	
	HW23S01*	0355-0490	
02	HW23N02	0500-0605	
	HW23V02	0610-0740	
	HW23S02	0745-0865	
03	HW23N03	0870-0945	
	HW23V03	0950-1050	
	HW23S03	1055-1150	
04	HW23N04	1155-1245	
	HW23V04	1250-1365	
	HW23S04	1370-1460	
05	HW23N05	1465-1575	
	HW23V05	1580-1645	
	HW23S05	1648-1710	
06	HW23N06	1715-1755	
	HW23V06	1760-1855	
	HW23S06	1860-1935	
07	HW23N07	1940-2035	
	HW23V07	2038-2116	
	HW23S07	2118-2190	
08	HW23N08	2192-2300	
	HW23V08	2305-2375	
	HW23S08	2380-2450	
09	HW23N09	2455-2525	
	HW23V09	2530-2615	
	HW23S09	2620-2700	
10	HW23N10	2705-2770	
	HW23V10	2775-2825	
	HW23S10	2830-2950	

E + Roof line of 23-354 drift west + W

0 25 50 75 100 125 150 170 200 cm

Approximate location of fractures: 1) Horizontal/sub-horizontal;
2) Vertical/sub-vertical.

*) Hole ID No. on videotape = HW23V01.